



Energy 2001
The Power of Wind
Ascension Island
Wind Farm

CRAIG MILLER
AIR FORCE SPACE COMMAND
June 2001



Overview

- **Background information**
- **Construction & operation**
- **Economics**
- **Site approval & environmental**
- **Follow on project**
- **Other possibilities**



Background information

- **Location of Ascension Island**
- **History of the island**
- **Air Force mission**
- **Base information**

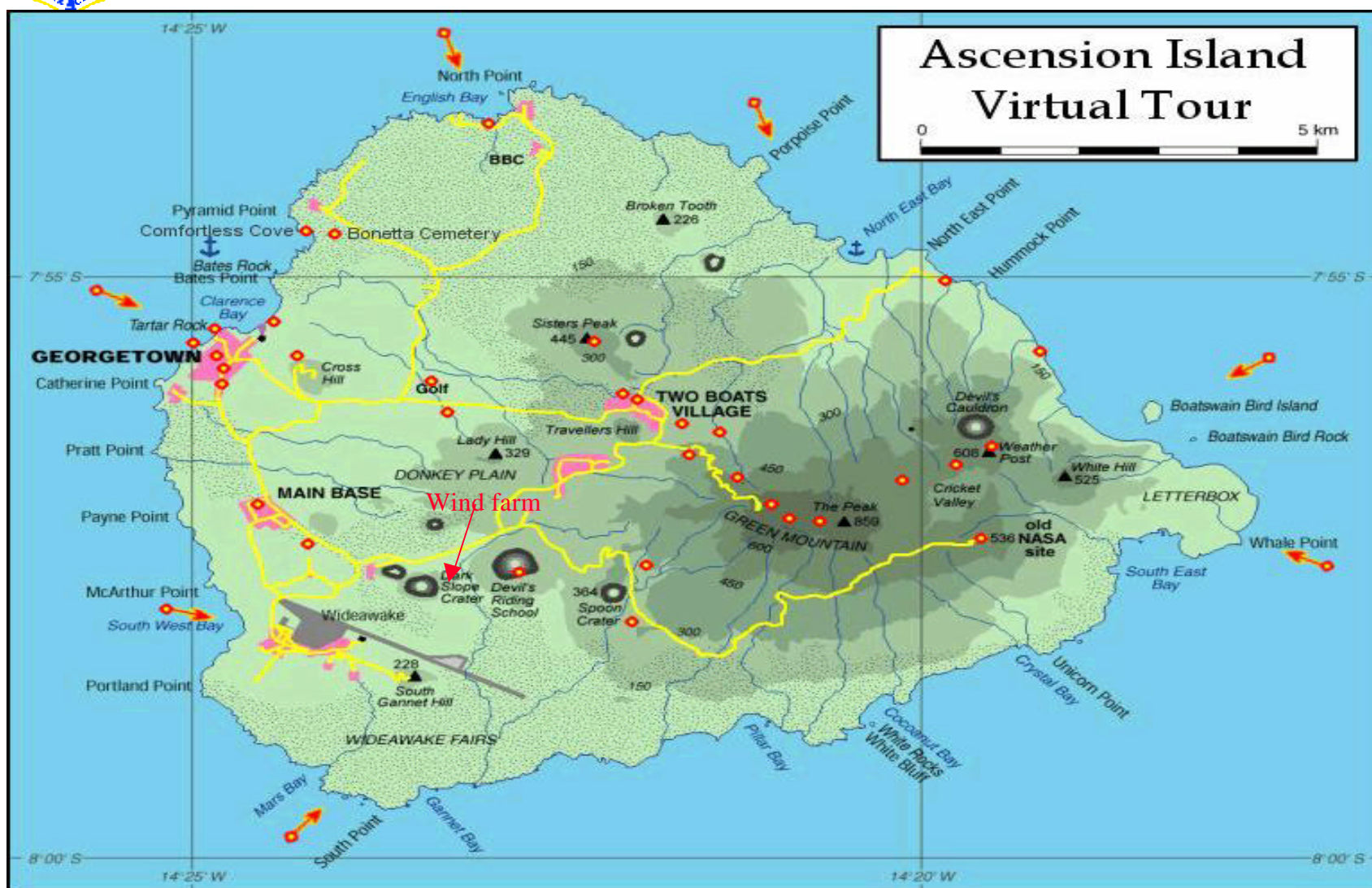


Background information





Background information





Background information





Background information



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Background information



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Background information

- **Air Force power generated by a prime power diesel-electric plant**
- **Air Force load averages 2.2 to 2.4 MW**
- **Two 1900 kW diesel generators operate in parallel with the wind farm**
- **Waste engine heat powers the desalination system**



Construction & operation

- **Project funded through AF Energy Conservation Investment Program (ECIP) - \$3.5 M**
- **Designed by DOE's Idaho National Engineering and Environmental Laboratory**
- **Prime contractor was joint venture between Pacific Industrial Electric and Difko Administration (US) Inc.**
- **Concept to construction complete - in 45 months**
- **Awarded Sept 95 with a 540 day performance period**
- **Project completed Sept 96 - 6 months ahead of schedule**



Construction & operation





Construction & operation





Construction & operation



- **Four three-bladed 225 kW MICON wind turbines for a total of 900 kW**
- **Two speed capable**
- **Turbine wind production range: 4 – 25 m/s (9 - 56 mph)**
- **Average Ascension wind speed: 7.8 m/s (17.5 mph)**
- **Wind farm control system located at the diesel-electric plant**



Construction & operation



CHALLENGE

- **S** Remote shipping - 5000 miles from Port Canaveral
- Restricted shipping schedules
- Pier restrictions
- Limited crane reach
- Limited island access



Construction & operation

- The wind farm supplements the diesel power plant
- Average wind power output is 342 kW
 - 38% capacity factor
- To meet base electrical load the power plant operates two 1900 kW generators creating a low load factor
- One generator operation unstable



Construction & operation

Total kWh Production Data:

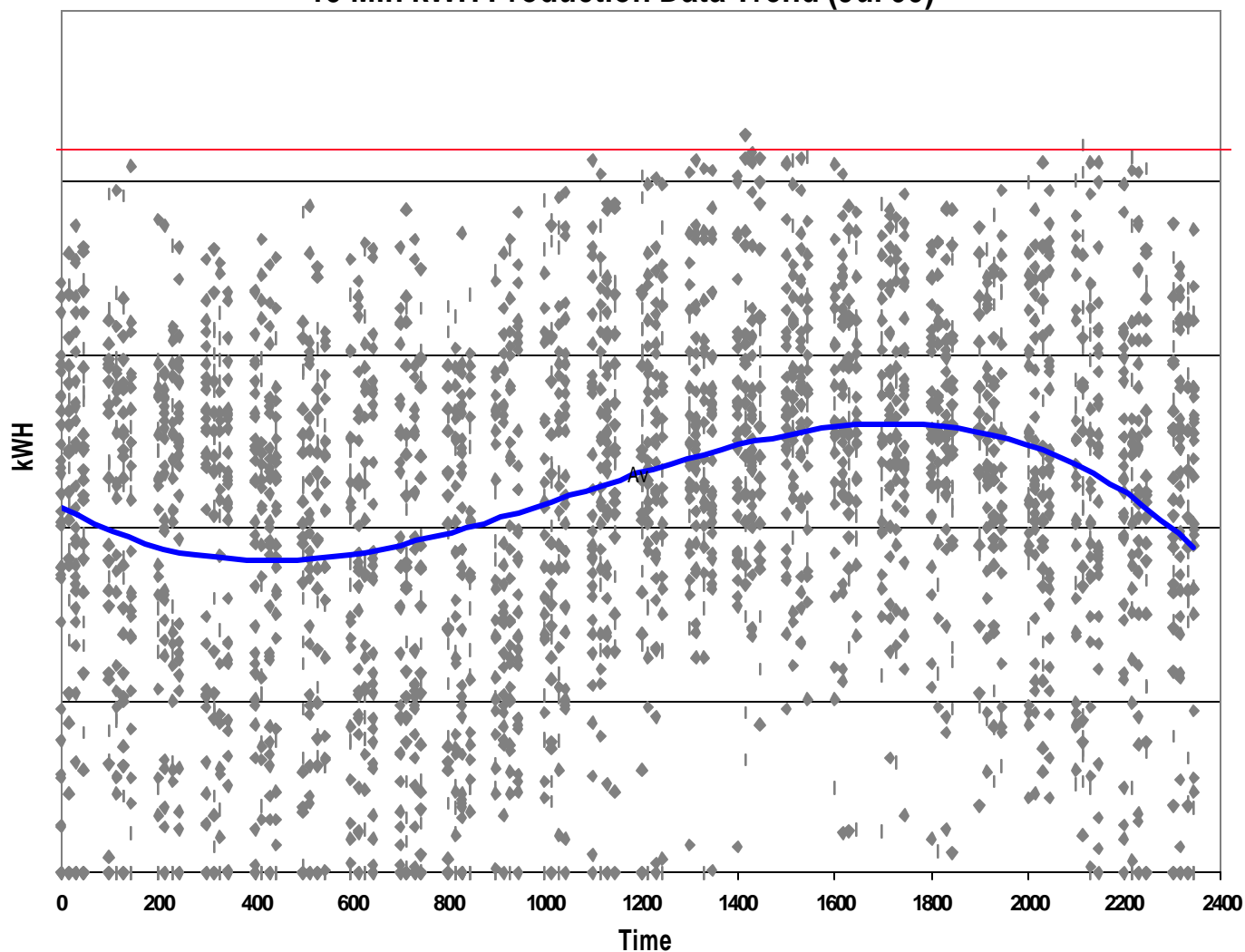
Year	Turbine 1	Turbine 2	Turbine 3	Turbine 4	Total Plant
CY 1996	228,961	230,185	229,895	227,570	916,610
CY 1997	754,967	764,171	762,595	755,345	3,037,077
CY 1998	790,920	797,490	797,908	794,124	3,180,442
CY 1999	767,209	770,995	648,714	758,685	2,945,603
CY 2000	720,657	710,484	675,363	715,177	2,821,681
Totals =>	3,262,714	3,273,325	3,114,475	3,250,900	12,901,414



Construction & operation

15 Min kWh Production Data Trend (Jul 99)

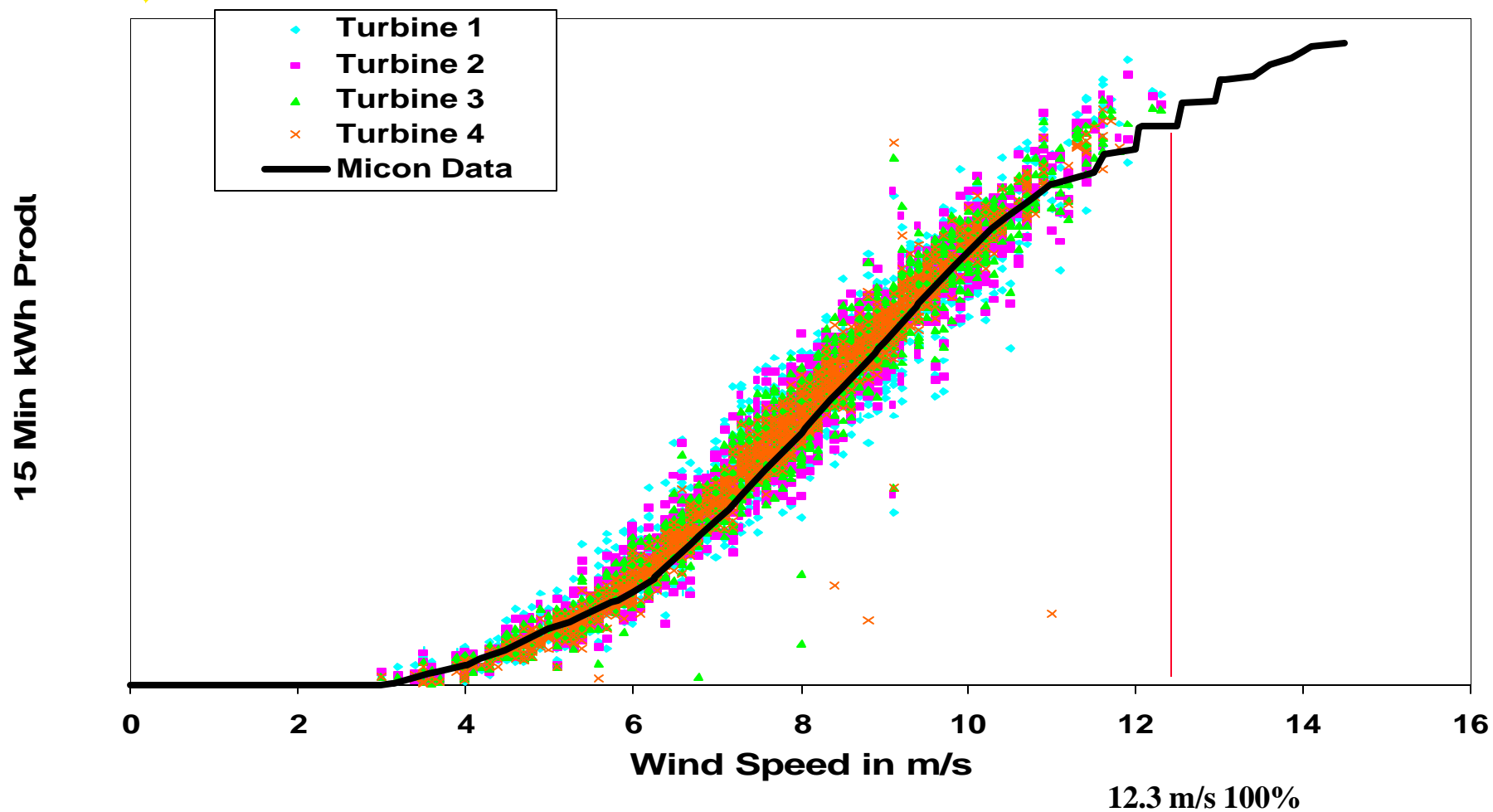
Maximum
wind farm
output





Construction & operation

Actual vs. Manufacturer's Performance Data





Construction & operation

- **Lessons learned**
 - **Perform resource assessment**
 - **Model loads**
 - **Mandatory site visit essential**
 - **Partner with the teams**
 - **Performance based specifications**
 - **Conquer corrosion control**
 - **Establish maintenance contract**



01/06/99



01/06/99



Economics

- **\$3.5 million invested**
- **Analysis used 3.2 million kWh per year produced**
 - **Four year average shows 3.0 million kWh per year produced**
 - **Total of 12 million kWh produced to the end of FY 00 (Sept 00)**
- **Design payback of 8.9 years on savings of \$350k per year**
 - **Actual Fuel Savings of \$250k per year (12.8 year payback)**
 - **Fuel oil prices for FY 01 significantly greater - 50% increase cost will reduce pay back**
- **Availability > 95%**



Site approval & environmental

- **Site approval**
 - **Location required negotiating a lease**
 - **Involving island administrator early on was important**
- **Environmental**
 - **Two main issues**
 - **Bird strikes**
 - **Electro-magnetic interference**



Site approval & environmental





Follow on Project

- **Description**
 - 1300 – 1800 kW (2 – 6 turbines)
 - Electric Boiler
- **Schedule**
 - Design complete Jun 00
 - Authority to advertise Mar 01
 - 700 day construction period
 - Estimated contract award Sept 01
- **Funding – FY01 Energy Conservation Investment Program**



Other possibilities

- **Lajes Field Wind assessment & design**
- **Vandenberg wind assessment**
- **Kaena Point wind assessment**
- **Antigua wind assessment**
- **San Remey wind assessment**
- **Green Power**



Other possibilities

- **Vandenberg AFB California**
 - **Renewable Energy Study at VAFB (1984-1985)**
 - **Many years of weather data collected**
 - **Install wind data loggers at potential sites**
- **Couple of avenues being considered**
 - **Submit project in the Energy Conservation Investment Program**
 - **Commercial ventures**
- **Site approval process underway**
- **Initial aviary study underway**



Other possibilities



*Just remember
anything that
could go wrong
probably will*



Thanks to

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